

THE

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EDITORIAL NOTES.

STAFF.

THE post of Director of Agriculture has been abolished and the head of the Department of Agriculture is now styled Secretary for Agriculture, S.S. and F.M.S.

Mr. A. S. Haynes is acting as Secretary for Agriculture, and Mr. L. Lewton Brain formerly Director of Agriculture is appointed to the new post of Technical Adviser (G. N. 2090—7-4-22). Correspondence with the Department should be addressed to the Secretary for Agriculture.

INVENTIONS.

It is thought that notes on inventions, connected with rubber or other agricultural products which are patented in Malaya from time to time, may be of interest to readers. These notes will be included in "Chemical Notes" and will contain information on new processes published in other journals which are considered to be of value and local interest.

RUBBER INVESTIGATIONS.

Notes and criticisms on rubber investigations carried out in other countries will also be included in the Bulletin.

MARKET PRICES.

Information in respect of market prices of agricultural products already grown or suitable for local cultivation, will be published quarterly. The London and American quotations will be included, if available. Suggestions will be welcomed in respect of any product which it is considered might be included.

SPOTTING OF RUBBER.

Samples of smoked sheet were received for investigation; these showed opaque patches when held up to the light, and were badly mottled in consequence. This is the first case of "Spotting," on smoked rubber recorded in this Department. The trouble was proved to be organic by sterilising the latex as completely as possible, when the resulting sheets were prepared quite clean.

CINCHONA.

During January the Assistant Economic Botanist spent three weeks in the chief Cinchona district of Java for the purpose of obtaining information concerning the Cinchona industry there.

MARKETS.

A London merchant, whose name and address will be supplied on application to the office, asks to be placed in touch with some firm or individual who can supply him with Kapok and Raw Cotton. (Reference No. D. A. 389/22).

Several enquiries have been received from other firms also who are interested in buying Kapok.

If producers of Kapok write to the Secretary for Agriculture quoting as a reference D. A. 908—1922, they will be put in touch with the enquirers.

SMALL RICE MILLS FOR ESTATES.

The attention of estate managers and others is drawn to the advantage which would result from installing small power mills on their estates to mill rice for the use of their coolies.

A small and inexpensive machine is the Engelberg Rice Huller which is in use on one estate and which works very well. Messrs. Guthrie & Co. are agents for the machine, which was exhibited at the Malaya-Borneo Exhibition in Singapore. It can be run by the power used in connection with rubber factories. In those parts of the country where the padi-planters have padi for sale (this applies particularly to the Krian district and to Province Wellesley) the estate manager could buy padi in bulk from the padi planter direct without the intervention of any middle man and without all the charges incidental to transporting the padi oversea from another country; and probably arrangements could be made for padi, either parboiled or not, to be sold by the Government Rice Mill at Bagan Serai.

The buying of local padi, parboiled or non-parboiled, and the hulling of it by estate manager would, apart from advantages to the buyer, bring great benefit to this country; by creating a market for padi it would encourage padi cultivation and it would at the same time keep in this country money which now goes into the pockets of padi-planters and others outside the country.

A further advantage is that the coolies who eat the non-parboiled polished rice will here find a substitute grown in the country, hulled by their own employers and free from the danger of beri-beri which goes with the use of the highly polished imported rice. The greater the demand for this local rice, the more encouragement padi-planters will have for increasing the supply by more planting. The question of polished rice and beri-beri was discussed at the meeting of the Planters Association of Malaya held at Penang on 27th February, 1922, and it will be seen that an increase in the use of our locally-grown Malay rice on estates will greatly help towards a solution of the question which every employer of labour must have at heart. At the meeting it was stated that "in the cause of humanity and the labour force the question could not be allowed to rest". It is to be hoped therefore that every single employer who can do so will contribute towards the most natural solution of all, the growing by Malaya of its own rice supply, by buying the locally-grown padi where possible and hulling it on his own estate.

Those interested can address enquiries to the Secretary for Agriculture, Kuala Lumpur. (Ref. No. D.A. 416/22).



THE DWARF COCONUT IN MALAYA.

BY H. W. JACK AND W. N. SANDS.

THE dwarf coconut, known in Malaya as the "nyior gading" has aroused much interest and criticism since Mr. W. P. Handover endeavoured to exploit it commercially in the pages of the Agricultural Bulletin, F. M. S. Vol. VIII No. 3.—Mr. Handover, in his article, stated that diligent enquiry was unsuccessful in tracing the origin of this dwarf race but that in his opinion the first palm occurred as a sport or mutant in Java, since scattered trees were found throughout Java and Sumatra, whilst reliable reports from India and Ceylon indicated that this variety was practically unknown in those countries. Furthermore, most of the oldest palms growing in Malaya, namely those in the Krian district of Perak, many of which are over thirty years old, appear to have been derived from fruits brought over from Sumatra or Java by the Banjanese rice-settlers and are therefore not of local origin.

Other apparently distinct dwarf races are known to be found in the Philippines, Java, Madagascar, Ceylon, the Maldives and Nicobar Islands but, according to Handover, only the Nicobar dwarf and the "coco nino" of the Philippines appear to resemble the 'nyior gading.'

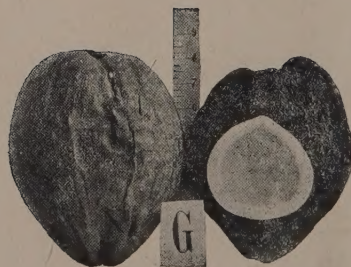
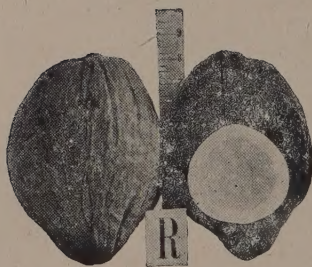
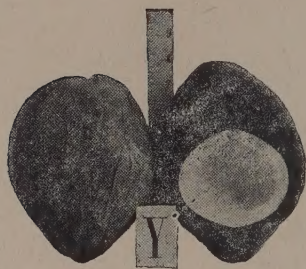
The "King" coconut which is often referred to as being identical with the 'nyior gading' of Malaya was reported to Handover as having a thin gelatinous meat, useless for the manufacture of copra and slow in coming into bearing.

In order to verify this report, fruits of the "King" coconut were obtained from the Ceylon Department of Agriculture for examination which revealed the fact that this dwarf coconut was quite distinct from the "nyior gading" but closely resembled the dwarf type known to the Malays as the "puyoh." Dr. Boldingh of the Department of Agriculture, Java, is of opinion that more than one variety of dwarf coconut may be known as the "King" in Ceylon because fruits which he obtained some time ago from that Island appeared to be different from the type examined and described below. The characters of what appeared to be typical fruits of the "King" and 'nyior gading' varieties are compared below:

Characters of dry fruit.	Nyior Gading.	King.	Remarks.
Shape of fruit	Ovoid ...	Ovoid ...	The King fruit is narrower than the "nyior gading."
Apex of fruit ...	Slightly sunken and "eye" small	Full and "eye" prominent	
Length of fruit ...	7 $\frac{3}{4}$ inches	7 $\frac{3}{4}$ inches	The King nut is slightly longer than the "nyior gading" and is quite different in shape.
Circumference (equatorial)	20 $\frac{1}{2}$ "	18 "	
Greatest thickness of husk (exocarp)	2 $\frac{1}{2}$ "	2 $\frac{1}{4}$ "	
Thinnest part of husk ...	2/5 "	$\frac{1}{2}$ "	
Thickness of shell of nut (endocarp)	1/10-1/5 in.	1/8-1/4 in.	
Length of nut	4 $\frac{1}{4}$ inches	4 $\frac{1}{2}$ inches	
Greatest width of nut ...	4 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "	Meat firm, but thinner than in the "nyior gading."
Thickness of meat (endosperm)	$\frac{1}{2}$ "	7/16 "	

Fruits of the "coco nino" were obtained from the Philippines and examination showed them to be much smaller than the "nyior gading" in every respect and differing in shape and the character of the apex. The nut characters resembled those of the "nyior gading" in shape only. It is almost certain therefore, that this coconut is not identical with the local variety unless the fruits obtained for examination were derived from trees growing under particularly unfavourable conditions, which is unlikely since they were said to have been collected in the best coconut growing district in the Philippines. The writers have not yet had an opportunity of studying the characters of the Nicobar dwarf, but fruits obtained from Sarawak under the name "nyior kapal" certainly resemble the local "nyior gading" and will probably be found to belong to the same race. The Superintendent of Land and Surveys, Kuching, Sarawak, was unable to give any reliable information regarding the origin of the "nyior kapal" but mentions that it is certainly not indigenous and was unknown in

• PLATE 1.



Sarawak not very many years ago. It is not planted there commercially, but is usually grown in the vicinity of houses. According to native reports, the coconut was first introduced into the country by the first Datoh Bandar who brought some nuts (plants?) with him on his return from Mecca some 30 years ago. They were called 'nyior kapal' because the Datoh stated that the palms were growing in tubs on the ship on which he took his passage to and from Jeddah.

It is unfortunate that the place and date of the first occurrence of the interesting and valuable ivory-yellow coconut are not known. Judging from observations and the evidence of local growers, it would appear to be a mutation from the tall or common form due to some change in the hereditary units or genetic factors. Evidently the change in a factor (or factors) which leads to the production of a palm with such pronounced size-differences from the normal type, takes place at rare intervals in the coconut, still it is of interest to note that dwarf types do occur where large areas of coconuts exist, and in widely distributed places.

Although no experiments along Mendelian lines have been made so far, we should expect to find that the Malayan dwarf form is a recessive mutant with perhaps only a single factor concerned, but as Dr. W. Bateson pointed out in his Croonian lecture of 1920, merely quantitative differences, for example those relating to size and height, seldom, if ever, have a perfectly simple inheritance.

There are several colour variations of this dwarf coconut such as yellow, green, red and intermediate shades of these colours, so that it is difficult to express an opinion as to which particular type is like the first mutant and which forms are the result of further mutations.

As a detailed description of the "nyior gading" has already been given by Handover in his article and in other publications there is no need of repetition in these notes. The photograph plate I, however, shows typical fruits and illustrates how closely they resemble each other; Y = the ivory-yellow type; R—the red (apricot); G = green. The measurements of the various parts of each are also very similar as the following table shows:

Characters of Fruit.	Ivory-yellow.	Red (apricot)	Green.
Length of fruit	7 $\frac{3}{4}$ "	8"	7 $\frac{3}{4}$ "
Circumference of fruit	20 $\frac{1}{2}$ "	21"	21"
Greatest thickness of husk (exocarp)	2 $\frac{1}{2}$	2 $\frac{1}{2}$ "	2 $\frac{3}{4}$ "
Thinnest part of husk	2/5	3/10	1/5
Thickness of shell of nut (endocarp)	1/10-1/5"	1/10-1/5"	1/10-1/5"
Length of nut	4 $\frac{1}{4}$ "	4 $\frac{1}{4}$ "	4-2/5
Greatest width of nut	4 $\frac{1}{2}$ "	4 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "
Thickness of "meat" (endosperm)	$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "

In the extensive plantations in the Port Dickson district, the mixed character of the palms is an unsatisfactory feature. Although the dwarf-yellow, the variety desired, predominates, other dwarf coloured forms, semi-talls and talls occur at intervals throughout. This admixture of varieties is no doubt due, in part, to the fact that, in planting these areas, a very large number of fruits had to be obtained from various sources, and it was not always possible to ascertain definitely whether each fruit had been obtained from a typical dwarf ivory-yellow palm. It is quite evident that natural crossing take place between the tall and dwarf races, so that the semi-talls, or intermediate forms, which occur, are probably first generation hybrids between the talls and dwarfs. The talls may also be hybrids, but we are inclined, at present, to regard them as pure dominants, which have segregated out in the second generation of a cross between the two races, and therefore the progeny of fruits collected from semi-tall forms. Careful breeding experiments, however, would be likely to clear up many of the doubtful points connected with the inheritance of these quantitative and colour characters.

The dwarf ivory-yellow variety is said to give 80% of plants true to type, even when fruits are collected in "kampongs" from palms growing in association with other varieties and open to cross-pollination.

In order to establish fields of dwarf coconut varieties at the Experimental Coconut Plantation at Sapintas, a large number of fruits was obtained from Sungei Nipah Estate, and sown on December 29th 1920.

The results obtained up to June 15th, 1921, are as follows:—

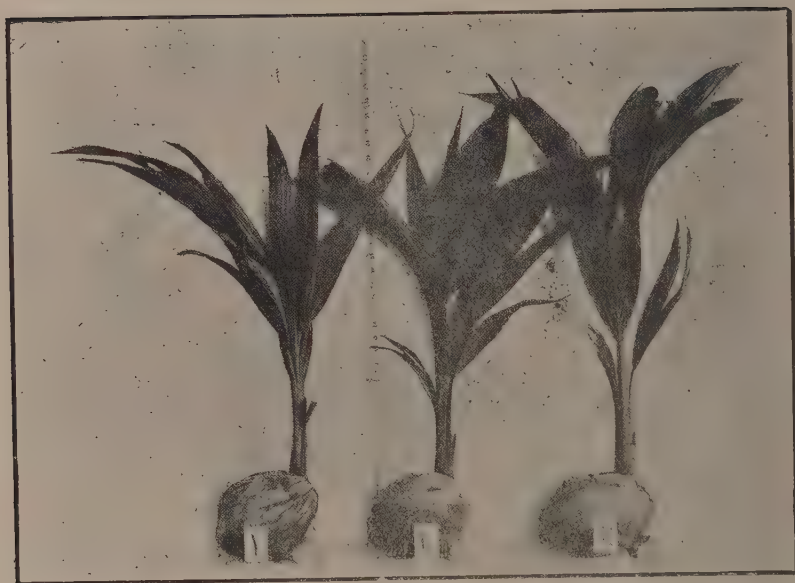
Dwarf Variety.	Number sown.	Number germinated.	Number true to type.	Number not true to type.
Ivory-Yellow	500	422	406 or 96.2%	16 or 3.8%
Green ...	570	434	298 or 68.7%	136 or 31.27%
Red ...	200	126	94 or 74.6%	32 or 25.4%

The high percentage, namely 96.2% of the ivory yellow variety which appeared to be breeding true, is a striking feature, and this notwithstanding that other varieties occur in the Sungei Nipah Plantation and the flowers were not artificially self-pollinated.

The colour characters of three of the principal strains of dwarf race grown locally are as follows:

IVORY-YELLOW: Petiole or stalk of leaf, *yellow*; petiole of youngest leaves *greenish-yellow*, usually closely covered with a brown felt of tufted hair which is quickly rubbed off as the leaflets expand; leaflets lighter green than other types. Young spathe *ivory-yellow*. Main stalk or axis of inflorescence and branches *ivory-yellow*. Floral leaves or perianth

PLATE 2.



segments of male and female flowers *ivory-yellow*. Fruit *ivory-yellow to yellow* before it starts to dry.

GREEN: Petiole of leaf *green*; petiole of youngest leaves, under hairs, *green*; leaflets *dark-green*. Young spathe *green*. Main stalk of inflorescence *greenish-yellow*; also the branches and perianth segments of the male and female flowers. Fruit *green* before drying.

RED: Petiole of leaf *warm-yellow*, darker than the *ivory-yellow* type. Young spathe *reddish*. Main stalk and branches of inflorescence *apricot* colour, as well as the perianth segments of the male and female flowers. Fruit *reddish-yellow* or *apricot* before drying.

It will be seen that, in each type, the colour of the petiole of the leaf corresponds fairly closely to that of the inflorescence and fruit. The colour differences of each dwarf can be seen quite clearly in the young leaves of the germinating nuts, and it is this fact which will aid the planter most materially in separating the different types in the nursery before planting them out. There remains, however, the problem of separating the dwarfs from the semi-tall and tall, which may possess similar colour correlation. Whilst this might present some difficulty, yet if sown about the same time, the shorter leaves of the dwarfs, compared with longer and larger leaves of the "semi-talls" and the still longer and larger leaves of the "talls," will enable a fairly accurate assortment to be made before removal.

Of course there may be fruits whose germination is retarded and others which produce poorly developed shoots; these features will add to the difficulty of making a perfect separation of the various types, but by closely studying the characters above described much purer "stands" of young plants can be obtained than are usual to-day.

In the photograph, Plate 2, are shown young plants of the dwarf *ivory-yellow*, red and green forms. The fruits were sown on December, 22th 1920. And on June 22nd, 1921, the colour and growth characters of the plants were recorded as under:—

IVORY-YELLOW: Number of leaves expanded *five*; length of longest open leaf, (the fifth) 2 feet 9 inches from base to tip. Colour of petioles of leaves *yellow*. Colour of rudimentary sheathing leaves *yellow*.

RED: Number of leaves expanded *five*; length of longest leaf, (the fifth) 2 feet 9 inches from base to tip. Colour of petioles of leaves *warm-yellow*. Colour of rudimentary sheathing leaves *warm-yellow*.

GREEN: Number of leaves expanded *five*; length of longest leaf, (the fifth) 2 feet 10 inches from base to tip. Colour of petioles of leaves *green*.

GREEN ; Number of leaves expanded *five* ; length of leaf, (the fifth), 2 feet 10 inches from base to tip. Colour of petioles of leaves *green*, but rather lighter than that of the petioles of the expanded leaves.

Thus the growth characters are strikingly similar, and the colours of each variety are quite distinct even in the earlier stages of the development of the plants.

A further photograph, Plate 3, illustrates the size-differences of a tall and a dwarf plant from fruits sown on December 21st 1920, and also recorded on June 22nd 1921, or roughly six months from the date of planting. Each plant has the same number of expanded leaves, namely five. Whereas the length of the fifth and largest leaf of the dwarf was 2 feet 9 inches only, that of the tall was 4 feet.

FLOWERING PERIODS AND POLLINATION.

A search through the literature dealing with coconuts reveals little information regarding their flowering periods or pollination. Knuth, in his volume on the "Pollination of Flowers" merely remarks that the coconut is pollinated through the agency of insects. Most books make no mention whatever of the biology of the coconut or its pollination,

Petch, of the Ceylon Department of Agriculture, described the flowers of the tall coconut in detail in popular terms and recorded observations on the flowering periods of a single palm, growing at Peradeniya, which is near the upper limit for coconuts. His observations showed that, under the conditions prevailing at Peradeniya, a period, varying from three and a half to five weeks, was required for the opening of all the male flowers of an inflorescence ; that an interval of two to five days then elapsed before the female flowers of the same inflorescence began to open and that the female flowers all opened in a period of from one to seven days according to the numbers of female flowers. According to his observations he naturally concluded that self-pollination was impossible except in the rare occurrence of overlapping of inflorescences on the same tree and that coconuts depended on cross-pollination by insects and probably also by the wind. He stated that bees and hornets, which feed greedily on the honey produced by both the male and the female flowers, were the chief visitors to the coconut flowers, and that the ubiquitous ant, though it revelled in the nectar of flowers was unlikely to assist in cross pollination or even to have access to the female flower at all, thanks to the natural protection afforded by its ring of nectar at the receptive period.

In the warm humid atmosphere of the lowlands of Malaya, coconuts appear to behave differently. The length of duration of the male phase is curtailed, while the duration of the female phase would appear to be longer in both tall and dwarf trees ; but the most striking difference is the fact that in Malaya the female phase not only begins, but most frequently ends before, or at the same time, as the male phase, thus rendering self-pollination the rule instead of being an occasional chance occurrence.

PLATE 3.



These notes however are only intended to refer to dwarf coconuts of the 'nyior gading' race, and the following table is of interest:—

Dwarf Coconuts.—Flowering Summary January to March.

Tree Number.	Type	Spath.	Male phase begins.	Male phase ends.	Female phase begins.	Female phase ends.	Duration of male phase days.	Duration of female phase days.	Number of female flowers.	Female flowers begin to open before end of female phase.	Female flowers being to open after male phase.	All female flowers open before end of male phase.	All female flower open after male phase.	All female flowers open within one day of end of male phase.	All female flowers open within two days of end of male phase.	All female flowers open within three days of end of male phase.
1	R	B	26/1	18/2	10/2	21/2	24	12	11	1	..	..	..	..	..	1
2	R	C	18/2	12/3	27/2	11/3	13	13	17	1	..	..	..	..	..	..
3	R	D	2/5	24/2	15/2	22/2	23	8	13	1	1	1	1	1	1	1
4	RY	B	28/2	20/3	15/3	20/3	21	6	3	1	1	1	1	1	1	1
5	Y	C	26/1	16/2	9/2	16/2	22	8	15	1	..	..	..	..	..	1
6	Y	C	12/1	1/2	1/2	4/2	20	5	3	1	..	..	..	..	..	1
7	Y	D	4/2	25/2	23/2	28/2	22	6	7	1	..	..	..	..	..	1
8	Y	E	8/3	22/3	15/3	20/3	20	6	5	1	..	..	..	..	..	1
9	Y	C	12/1	30/1	25/1	2/2	19	9	3	1	1	1	1	1	1	1
10	Y	D	2/2	23/2	20/2	24/2	22	5	15	1	1	1	..	..	..	1
11	Y	E	2/3	19/3	12/3	17/3	18	6	22	1	..	..	..	..	..	1
12	Y	B	20/1	9/2	5/2	11/2	21	5	7	1	..	..	..	..	..	1
13	Y	C	19/2	12/3	11/3	15/3	22	5	9	1	1	1	1	1	1	1
14	Y	B	8/1	27/1	22/1	26/1	20	7	10	1	..	..	..	..	..	1
15	Y	C	30/1	18/2	14/2	18/2	20	7	9	1	..	..	1	1	1	1
16	Y	D	24/2	12/3	7/3	13/3	20	7	10	1	..	..	1	1	1	1
17	Y	E	6/2	22/2	18/2	23/2	19	6	14	1	1	1	1	1	1	1
18	Y	D	24/2	16/3	5/3	11/3	21	7	9	1	..	..	..	..	..	1
19	Y	E	26/1	16/2	9/2	15/2	22	7	11	1	..	..	..	..	..	1
20	Y	C	12/2	12/3	2/3	11/3	22	10	25	1	1	1	1	1	1	1
21	Y	D	25/1	12/2	2/2	11/2	19	10	20	1	..	..	..	..	..	1
22	Y	E	23/2	14/3	1/3	11/3	20	11	12	1	1	1	1	1	1	1
23	Y	C	27/1	18/2	7/2	18/2	20	12	17	1	1	1	1	1	1	1
24	Y	D	22/2	15/3	28/2	13/3	22	14	11	1	1	1	1	1	1	1
25	Y	C	16/1	4/2	30/1	4/2	20	16	17	1	1	1	1	1	1	1
26	Y	D	9/2	1/3	15/2	28/2	21	13	18	1	1	1	1	1	1	1
27	Y	E	10/3	28/3	15/3	21/3	19	7	14	1	1	1	1	1	1	1
28	Y	B	2/1	24/1	26/1	27/1	23	2	2	1	1	1	1	1	1	1
29	Y	C	25/1	15/2	11/2	15/2	22	5	8	1	1	1	1	1	1	1
30	Y	D	26/2	17/3	18/3	21/3	20	4	3	1	1	1	1	1	1	1
31	Y	C	21/1	10/2	7/2	10/2	22	4	7	1	1	1	1	1	1	1
32	Y	D	3/2	23/2	18/2	24/2	21	7	10	1	1	1	1	1	1	1
33	Y	C	10/1	29/1	19/1	25/1	20	7	11	1	1	1	1	1	1	1
34	Y	D	28/1	18/2	5/2	15/2	23	11	13	1	1	1	1	1	1	1
35	Y	E	19/2	8/3	26/2	7/3	18	10	16	1	1	1	1	1	1	1
36	Y	C	7/1	4/2	25/1	2/2	19	6	19	1	1	1	1	1	1	1
37	Y	D	7/2	27/2	18/2	24/2	21	7	14	1	1	1	1	1	1	1
38	Y	E	2/3	18/3	13/3	17/3	17	5	20	1	1	1	1	1	1	1
39	Y	D	30/1	18/2	7/2	15/2	15	9	21	1	1	1	1	1	1	1
40	Y	E	73/2	12/3	2/3	11/3	18	10	17	1	1	1	1	1	1	1
41	Y	C	7/1	30/1	24/1	30/1	24	7	13	1	1	1	1	1	1	1
42	Y	D	2/2	22/2	11/2	22/2	21	12	16	1	1	1	1	1	1	1
43	Y	E	26/2	17/3	7/3	17/3	20	11	13	1	1	1	1	1	1	1
			AVERAGE			886 21			333 113	40	2	30	4	7	7	7

The time that elapses between the end of one male phase and the beginning of the succeeding one averages four days.

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The time that elapses between the end of one male phase and the beginning of the succeeding one averages four days.

THE ABOVE TABLE SHOWS.

(1) That the inflorescences on the same tree follow each other after an average interval of four days.

(2) That in two cases only out of forty three, did overlapping of inflorescences occur.

(3) That the average duration of the male phase was 21 days, with a variation of from 15-24 days.

(4) That the average duration of the female phase was 8 days. This average seems independent of the number of female flowers on the inflorescence, but might be reduced over a longer period as the weather was unusually showery, though sunny, during most of the period covered by these records.

(5) That in forty out of the forty three cases, the female phase began before the end of the male phase.

(6) That in forty out of the forty three inflorescences the female phase ended at the time, or earlier than, the male phase, thus making self-pollination not only possible but very highly probable.

(7) That the end of the female phase was never more than three days behind the end of the male phase making self-pollination still possible in dry weather, since coconut pollen-grains appear to maintain their viability for several days under fairly dry conditions.

(8) That overlapping of inflorescences only occurred twice out of forty three cases.

The trees on which the observations were taken were approximately eight years old and fairly widely planted, but not well cared for as light 'blukar' was beginning to establish itself at the expense of the coconut trees. However, shortly before the observations commenced a space round each tree was cleared and cultivated. In support of the facts revealed in the above table, three unopened inflorescences were bagged in muslin bags and it was found that in each case, self-pollination was effected naturally and fruits, which still remained on the trees, were formed.

Again, three other inflorescences were emasculated immediately on opening and it was found that, though the female flowers behaved normally, no pollination took place and no fruits were formed, although male flowers on adjacent trees were in full bloom. In a similar connection, it has been observed that odd isolated coconut trees growing even under bad conditions produce fruit so that self-pollination must have taken place. When coconut flowers are in full bloom, at about 10 a.m., when the dew has dried up and when gentle breezes frequently begin, clouds of pollen can be seen floating away in the sunlight. In a very slight breeze these pollen clouds do not travel far owing to the weight of the pollen but it is highly probable that with the strengthening of the breeze as the day advances the pollen clouds are carried to a considerable distance and thus cross-pollination is effected.

In the earlier part of this paper it was pointed out that ninety six per cent of seedlings of the ivory yellow type of the 'nyior gading' race appears to breed true. In addition to the various facts already mentioned this high percentage also supports the contention that self-pollination is the rule.

SUMMARY.

1. The probable origin of the "nyior gading" or ivory-yellow dwarf coconut and two other allied forms, grown in Malaya is discussed.
2. The colour, flower and fruit characters of the dwarf palms are described, as well as the growth and colour differences of the young leaves of the germinating fruits.
3. It is shown that by carefully noting the colour and growth characters of young plants, a fairly accurate separation of the dwarf varieties from semi-tall and tall forms can be made in the nursery which will enable much purer 'stands' of the type, or types, desired to be established in the field than are usual at the present time.
4. The results of observations on the flowering phases of the palms are given, and it is shown that the flowers are as a rule self-pollinated in the lowlands of Malaya.

PLATE 4.



THE KING COCONUT.

LOCAL LAND TENURE.

BY INCHE MOHAMED NOOR.

THE object of this article is to compare the conditions governing land tenure in Province Wellesley and Penang with those in the Federated Malay States.

It will be interesting first to say something of the lands held in the Straits Settlements under titles issued before the coming into force of the Ordinance of 1886, which ordinance and amendments thereto now govern the conditions of land tenure.

In the first place, the term *Indenture* is used for certain lands held under titles issued by the East India Company. Such lands are Freehold and are rent free. Other lands are held under a *Grant* formerly issued by the Colonial Government on payment of a fixed rent. There are also lands held under *Lease* granted before the coming into force of the 1886 Land Ordinance. These leases are for 99 or 999 years.

Similarly in the Federated Malay States certain lands are still held under agreements made before European administration, as well as other lands held under early laws not now in force. An instance of the former is the *Certificates* which have been issued to persons who have proved their occupation of lands before European administration. These certificates are in perpetuity. An instance of the latter is the *Permit*. Under an old law, not now in force, permits, to occupy in perpetuity, have been issued by the State.

The law at present governing land tenure in the Straits Settlements is the "Crown Lands Ordinance of 1886" and rules since made under it. All lands issued under this existing law are either *Statutory Grants*—a title issued by His Excellency the Governor at a rent subject to revision once every 30 years—or *Lease*, a title carrying special conditions and subject to re-entry if rent is not paid within 30 days after the appointed time.

The law now governing land tenure in the Federated Malay States is the "Land Enactment of 1911" and the land rules under this Enactment. Lands alienated under this enactment are (1) *Grants* which are usually in perpetuity, approved and signed by the Resident; (2) *Leases*, either for mining or agriculture and usually for 21 years and (3) *Entry* in the Mukim Register for lots of 100 acres or less. This E.M.R. is signed by the Collector of Land Revenue of the district. For areas of over ten acres the authority of the Resident must be obtained. A Certificate of Title is issued in cases where Grants of land are transferred or partitioned.

At this stage it may be as well to point out a difference between the "title" in the case of the small holdings in the Straits Settlements and that in the Federated Malay States. In respect to those lands in the S.S., the "title" is the Grant issued and the registry record is the "evidence of title"; whereas in the F.M.S., the "title" is the entry in the Mukim Register, and the Extract from the Mukim Register issued to the owner, is only the "evidence of title."

Application for Crown Land in Province Wellesley and Penang, whether exceeding ten acres in area or below ten, should be made in writing addressed to the District Officer of the district in which the land applied for is situate. The same procedure is adopted in the F.M.S. except that the application by natives for land not exceeding ten acres in area can be made orally, either to the Collector of Land Revenue or to the Penghulu of the Mukim.

The Collector of Land Revenue for the Island of Penang, the Senior District Officer for Province Wellesley and the District Officer for Dindings have in their respective districts authority to approve all applications for land the area of which does not exceed 5 acres; whilst the Collectors of Land Revenue in the F.M.S. can approve applications up to ten acres. In all other cases, the approval of the Residents of the State in the F. M. S. or of the Resident Councillor in Province Wellesley and Penang must be obtained.

Lands in the F.M.S. held under E.M.R. are subject to any of the following conditions endorsed by the Collector on the Title:—

- (a) That within the first year from the date of his receiving authority to occupy the land, the applicant shall plant up one-half of the land and before completion of the third year plant up the remainder of the land, with such number of trees of economic value and of such kinds as may be determined by the Collector at the time of approving the application and shall thereafter maintain the land and the trees to the satisfaction of the Collector;
- (b) That the Collector, at the time of approving the application, may determine that no specified products may be cultivated on the land.
- (c) That the Collector may determine that only specified products may be cultivated on the land.

In the Straits Settlements no one is allowed to plant tapioca or pine-apples or other crops which are exhaustive to the soil, except on the condition that rubber or coconut or other approved trees shall also be planted on the land; but in all cases in which land is to be granted on special conditions as to planting or cultivation, such conditions, agreed to by the applicant, shall be endorsed on the Grant.

PREMIUM AND RENT IN THE S.S.—Regarding premium of land, the officer authorised to approve the land applied for shall decide whether there shall be reserved a premium or an annual payment in lieu thereof, but in the absence of special circumstances the following rules are to be observed :—

- (a) In lieu of premium, an annual payment in addition to quit-rent may be accepted in the case of agricultural land which is likely to be occupied permanently.
- (b) The demand of premium shall be made on all agricultural or other lands liable to be abandoned through exhaustion of the soil by the crop planted or from any other cause.

Any portion of the payment in lieu of the premium may at any time be reduced by payment of the amount of premium which it represents.

When lands are alienated for auction, the price paid by the successful bidder shall be the premium.

As regards quit-rent, the minimum is \$1.50 per acre on agricultural land held under Statutory Grant, subject to revision every thirty years.

PREMIUM AND RENT IN THE F.M.S.—The minimum premium on agricultural lands having road frontage and exceeding ten acres in area is \$3 per acre and on those having no road frontage is \$2 per acre. In Pahang no premium is payable on agricultural lands that exceed the above area. Agricultural lands not exceeding ten acres in area are divided into three classes. On first class lands the premium is fixed by the Resident when such lands are not alienated for auction; but when such lands are alienated for auction, the premium thereon is the price paid by the successful bidder at the auction. No premium is charged on lands of the second and third classes. Lalang land may be alienated without premium.

The annual rent in respect of lands exceeding ten acres in area and not subject to a cultivation condition is as follows :—

- (a) For first class lands.—\$1 per acre per annum for the first six years and thereafter \$4 per acre per annum.

In Pahang do. 50 cents per acre per annum for the first six years. \$2 per acre per annum from the 7th to the 10th year. \$4 per acre per annum after the 10th year.

- (b) For second class lands.—\$1 per acre per annum for the first six years. Thereafter \$3 per acre per annum.

In Pahang do. \$3 per annum after the 10th year.

The following rent is charged on lands not exceeding ten acres in area :—

- (a) For first class lands.—\$1.20 to \$3.20 per acre per annum
 In Pahang do. \$1.00 to \$3.20 do
 (b) For second class lands.—.80 cents per acre per annum
 (c) For third class lands.—.60 cents per acre per annum
 (d) For lalang lands.—\$1 per 100 acres or part thereof
 for 7 years and thereafter \$1
 per acre.

In Province Wellesley and Penang the usual rate of the rebate of rent is two-thirds on land cultivated with coconut or with rubber and in the F.M.S. the rebate of rent on land cultivated with coconuts is such as to reduce the rent to \$2 per acre. On land cultivated with any other approved agricultural product the rate of rebate is such as to reduce the rent to \$1 per acre. Rebate allowed in Province Wellesley and Penang will not be for more than six years and that in the F.M.S. will continue only so long as the land is kept under bona fide cultivation.

The sub-letting of land in Province Wellesley and Penang and in the Federated Malay States is fairly common. Land is leased out to another person by mutual agreement made in a lawyer's office. The terms and the period of the lease are to be stated therein together with the amount. The Agreement is duly stamped in the Stamp Office.

The fee for the preparation and registration of a Grant or Lease in Province Wellesley and Penang is \$5 and the fee for the preparation of a Grant in the F.M.S. is \$2.

Survey charges in the Straits Settlements are as follows :—

For lots not exceeding 2 acres	...	...	\$5.00 per lot
For lots exceeding 2 acres and not exceeding 5	10.00	..	
For lots exceeding 5 acres and not exceeding 10	20.00	..	
For lots exceeding 10 acres and not exceeding 50	60.00	..	
For lots exceeding 50 acres and not exceeding 100			
\$1.20 for every acre or part thereof.			
For lots exceeding 100 acres and not exceeding 500 acres			
\$120.00 for the first 100 acres, and 90 cents an acre for every additional acre or part thereof.			

In the F.M.S. the survey charges on agricultural lands not to be held by Entry in the Mukim Register are as follows :—

(a) 5 acres and under	...	...	...	\$15.00
for each additional acre up to 10 acres	...	...	...	2.00
10 acres	...	...	...	25.00
for each additional acre up to 25 acres	...	...	...	1.50
50 acres	...	...	...	85.00
100 acres	...	...	...	135.00
500 acres	...	...	...	175.00

(b)	on lands to be held by E.M.R. :—				
	3 acres and under.	...	...	...	\$3.00
	for each additional acre up to 10 acres	...	...	...	1.00
	10 acres	...	...	...	10.00
	25 acres	...	...	...	21.25
	50 acres	...	...	...	46.25

CHEMICAL NOTES.

BY B. J. EATON.

CASTOR OIL CAKE.

A number of samples of locally manufactured castor oil and of castor oil cake from seed harvested on a local estate have been examined.

Although the oil content of the cake is rather high, which will retard somewhat the decomposition of such cake in the soil, it is considered that, under tropical conditions, the cake should be suitable as a fertiliser. Its use has been recommended on one or two coconut estates, since the price is considerably lower than imported cake from India or Ceylon. Information kindly supplied by Mr. Kelway Bamber, Government Agricultural Chemist, Ceylon, shows that cake containing even a higher percentage of oil is used as a fertiliser in Ceylon.

CITRONELLA OIL.

A sample of Citronella oil distilled at the Department was forwarded to the Malay States Information Agency for sale and realised 2/6 per lb, which was the top market price of this oil at the time. The quality was considered to be equal to the best Burmah oil, which has the same value as the Java oil.

PINK SPOT ON TREE SCRAP.

Enquiries have been received in connection with the occurrence of pink spot on tree scrap. This spotting, which sometimes occurs on the scrap on the tree on the day after tapping and sometimes develops on such scrap after being brought to the factory, is considered to be caused by *Bacillus prodigiosus*. The spot will not affect other rubber except by actual contact with wet rubber. If the tree scrap is badly infected it may be advisable to sort out the affected scrap and to crepe this separately or with a lower grade, such as bark scrap or earth scrap, since the pink discolouration may persist in the finished crepe and will lower its market value. As far as is known this spot does not affect the real quality of the rubber.

PINK SPOT ON BLANKET CREPE.

For several months past, the blanket crepe prepared from native unsmoked sheet in several of the large factories in Singapore has been badly affected with pink spot.

In some cases the discolouration has been found by the writer on the original sheets, while in others it has developed in the thick crepe during drying.

The drying rooms in these Singapore factories are however very poor and ill-ventilated and the humidity must be extremely high, especially in the damp atmosphere in Singapore.

In such cases the only remedy is to prepare a thin crepe, which should be hung till completely dried and then converted to blanket crepe by re-milling. The thin dried crepe when converted to blanket crepe will only absorb a small amount of moisture, chiefly on the surface, which is more rapidly evaporated than the moisture in the interior of wet blanket crepe.

The soaking of the thick crepe, if prepared direct from the sheets, in a dilute solution of formalin should also eliminate or reduce the tendency of such spot disease, since pink spot and other coloured spots on rubber are produced by different organisms, which can only develop in the presence of moisture and air.

INVENTIONS.

The Peachey Process:—Although this invention is now more than two years old, interest in eastern tropical rubber producing countries has been aroused by the fact that a company has been started to work the process in Ceylon and Malaya.

The process is based on the discovery that when the two gases sulphur dioxide and hydrogen sulphide are allowed to interact, nascent sulphur is produced which is extremely reactive and vulcanises rubber, placed in a chamber in which the reaction takes place, at low temperatures.

The rubber is subjected to the action of the two gases successively so that the sulphur is liberated in the rubber.

Since raw rubber is not a good absorbent of gases it would appear that only thin layers or sheets of rubber can be treated successfully. If thick sheets are used, only a surface vulcanisation will be effected. It has been found however that, by dissolving rubber in a solvent and then treating the rubber solution with the two gases, vulcanisation is effected in the solution, or the rubber can be dissolved in one portion of the solution and the gases in another portion and the two solutions mixed to effect the same result.

When the final solution is evaporated, the residual rubber is found to be vulcanised. This two-solution process therefore enables thick vulcanised articles to be built up from thin sheets.

The chief advantages of the process are :—

- (1) The elimination of steam and heat required in the present hot process of vulcanisation.
- (2) Its rapidity compared with the hot process of vulcanisation.

- (3) The regulation of the amount of sulphur necessary for vulcanisation, so that no excess is left in the manufactured articles to cause "blooming."
- (4) The gases are said to be cheap and easily obtained or produced.
- (5) Colouring matters, especially organic dyes and other organic filling materials which are affected by the hot process of vulcanisation, can be introduced.

The process should have a number of new applications for the manufacture of articles in which rubber may be partly or wholly substituted in place of other materials. A few such applications are the manufacture of floor, wall and upholstery coverings, boot and shoe manufacture, bags and other leather articles, proofed coloured fabrics as water-proof garments, belting, packing material, toys, boxes and roofing and insulating materials.

Schidrowitz Process:—In this process, latex in an alkaline condition (to inhibit coagulation) is vulcanised direct by the addition of a vulcanising agent (sulphur or an alkaline polysulphide) with or without the use of accelerators, and the application of a suitable temperature and pressure.

The caoutchouc or rubber in the latex is stated to be vulcanised and the vulcanised rubber remains in colloidal suspension, little or no coagulation taking place. The rubber is separated from the vulcanised latex by evaporation or by the addition of a suitable coagulant. The vulcanised rubber so produced may be washed, milled or sheeted and subsequently dried and manufactured into various articles. The vulcanised latex may also be evaporated on fabrics, producing a proofed material. Colouring and other filling materials can be added to the latex to produce a number of different articles. The applications of this process would also appear to be extensive and somewhat similar to those of the Peachey process.

It is interesting to note that Devon Estates Ltd., Malacca, has acquired rights for this process.

Kaye's Process:—The invention by Kaye has a definite object viz. the incorporation of latex with paper pulp, for the production of a stronger and more satisfactory paper making material or for the manufacture of cardboards etc. This process also indicates a new use to which rubber can be put.

Laub Process:—The Laub process, invented by Mr. Laub of Johore, consists in the addition of sulphur, as a vulcanising agent, and other fillers direct to latex. The mixture is coagulated and the thick mass of rubber and fillers can be moulded while still wet and subsequently dried and vulcanised by heat.

This part of the process however would appear to be similar to proposals brought forward by Bamber and others some twelve or more years ago.

One novel aspect of the Laub Process however is the discovery that when fine powders are added in sufficient quantity to latex, the latex coagulates without the addition of other coagulants. Basic substances, in the form of fine powder, such as zinc, magnesium, lead or calcium oxides and the carbonates can be used.

The most important point however, arising out of the Peachey and Schidrowitz processes in particular, and in connection with the use of certain accelerators, is the recent hypothesis put forwards by Bedford and Sebrell in America, that the reactive (nascent) sulphur, produced in the Peachey process and by the use of polysulphides and certain accelerators, is tri-thio-ozone, which these investigators claim to have isolated. These investigations may have far reaching effects in connection with the vulcanisation of rubber.

The writer is of opinion that new processes of this nature are likely to have more effect on the consumption of raw rubber than most of the proposals made for the utilisation of raw unvulcanised rubber in the manufacture of various rubber goods. In such processes also, almost pure rubber can be used, if required, in the manufacture of certain articles, since these need only contain, apart from the rubber, the small amount of sulphur essential for vulcanisation and would not develop the defects usually associated with the use of raw unvulcanised rubber. Articles containing such high proportions of rubber require the test of time to ascertain their lasting qualities.

PROGRESS REPORT ON THE EXPERIMENTAL PLANTATION, SERDANG.

By B. BUNTING.

THE opening up of the Agricultural Reserve at Serdang with a view to establishing a Large Scale Experimental Plantation, for crops other than Rubber and Coconuts, in the State of Selangor was commenced on the 15th October, 1920. The present area of the Reserve is approximately 1000 acres. The following report shows the progress made up to September, 1921.

FELLING AND CLEARING JUNGLE.

Altogether an area of about 650 acres has been felled and burnt off. Of this area 248 acres have been stumped and clean cleared of all timber whilst clean clearing is now in progress on the new 200 acre block recently transferred from Mining Reserve to Agricultural Reserve. At the present rate of progress it is expected that by the end of 1921 an area of approximately 450 acres of land will be clean cleared and free from all timber and bertam stumps ready for planting, whereas the proposed planting programme only requires 440 acres of land up to the end of 1922.

It might be mentioned that immediately the areas are clean cleared they are planted up with a leguminous cover crop, principally *Centrosema plumieri*, which will be allowed to remain until the land is required for planting purposes.

PROPOSED PLANTING PROGRAMME.

The proposed planting programme will be found at the end of this report and reference to it will show the areas of each crop which it is proposed to plant each year up to the end of 1923.

This programme is provisional and areas under any particular crop may be increased or reduced according to circumstances. Any new crops likely to be of commercial importance will be added to the list from time to time and to make this as representative as possible a close watch is being kept on all publications from other tropical countries with a view to procuring such planting material as may be required.

An area of approximately 10 acres of land was specially reserved for nurseries and this has been divided up into three blocks which contain altogether 365 nursery beds, some of which are shaded and the balance left open for plants which do not require shade. The area is situated near a good water supply and is securely fenced in with barbed wire.

The nurseries are well-stocked with planting material most of which will be ready for planting out in the field during the next three months.

PLANTING MATERIAL.

Although it has not yet been possible to plant out the various crops in their permanent quarters in the open most of the planting material is ready in the nurseries and it is only a question of selecting the areas on which the different crops are to be planted.

As soon as the new area of 200 acres has been clean cleared the whole of the land will be carefully measured out into blocks of varying acreages and classified according to the soil conditions, etc., before being allotted to any particular crop.

The proposed programme contains a comprehensive list of crops to be given a trial and every effort has been made to collect planting material as the following information will show :—

(1) PLANTING MATERIAL IN NURSERIES AT SERDANG.

Sugar Cane.—Stock of 14 of the best varieties of cane grown in Java, now well-established.

Sugar Palm.—About 4,000 seeds planted, germination slow, but many seedlings now appearing.

Coffee.—A large supply of seedlings of 5 high-yielding varieties obtained from Java in 1915. Sufficient to plant up at least 10 acres.

African Oil Palm.—Four lots, comprising over 10,000 seeds, from Experimental Plantation, Kuala Lumpur, in addition to 1230 seeds of a hard-shelled variety from Nigeria, germination fair, but incomplete.

Illipe Nut.—2,000 seeds newly planted in nurseries.

Castor Oil.—A small supply of seed of an early-cropping variety was received from Rhodesia and sufficient seed has been harvested to plant up one acre in the open. One acre of large-seeded (Kedah) variety and four acres of small-seeded local variety sown in the open.

Candle Nut.—400 seeds have been planted in nurseries,

Citronella Grass.—Over 10,000 bundles planted on roadsides—will be sufficient to provide stock later.

Lemon Grass.—100 bundles planted in nursery beds.

Patchouli.—A fair number of cuttings of the ordinary variety has been sent out from Kuala Lumpur and established in nurseries.

Vetiver Oil Grass.—About 40 small clumps, obtained from Port Dickson, planted in nurseries.

Sisal Hemp.—25,000 bulbils now ready for planting.

Mauritius Hemp.—16,500 bulbils ready for planting out.

Kapok.—About 10,000 seeds planted in nurseries. Germination very good and many plants now ready for planting out in field.

Cotton.—Selected seed of varieties of Sea Island cotton received from the West Indies, grown in the open. Growth shown was satisfactory and pure seed has been saved for further experiments. Samples of the cotton are being sent to England for examination.

Roselle Fibre.—About 7,000 seeds planted in nurseries have shown good growth and are being allowed to flower for seed production.

Roselle (Red type).—Two dozen cuttings have been planted in nurseries.

Bowstring Hemp.—500 plants have been planted up in nurseries.

Bromelia Fibre.—A few fibre plants of a species of *Bromelia* have been planted in nursery beds in the shade.

Manila Hemp. 100 suckers have been planted out in the open and are doing well.

Sunn Hemp. One bed of plants in nurseries.

Bimlipatum Jute. A small supply of seed, received from Kuala Kangsar, has been planted in nurseries.

Rhamie. 100 rooted cuttings planted in nursery beds.

Cinnamon. Sufficient seedlings to plant up 10 acres established in nursery beds. They are somewhat small as yet, but doing well.

Vanilla. 3 boxes of rooted-cuttings have been planted in nurseries.

Cloves. 10 lbs. of seed recently planted in nursery beds.

Ipecacuanha. 50 young plants are established in nurseries.

Coca (Cocaine). A few seedlings are growing in nurseries, whilst 1 lb of fresh seed has been sown recently.

Croton Oil. A large number of seedlings is now ready for planting out.

Annatto. A large supply of seedlings in nursery ready for planting.

Tuba Root. A few cuttings have been established in nurseries.

Limes. 2,000 lime fruits were obtained from the Jong Fruit Growing Syndicate, Teluk Anson, and these have produced sufficient seedlings to plant 20 acres. Germination commenced within three weeks of sowing the fresh seed and the plants are growing well.

Betel Nut. 1,000 seeds planted in nurseries.

Guinea Grass. 2,000 small clumps have been established.

In addition to the above over 1,000 lbs of *Centrosema plumieri* seed have been planted in the open as a cover crop. A number of shade and ornamental trees has also been planted on the roadsides.

(2) PLANTING MATERIAL AT KUALA LUMPUR.

Patchouli. Rooted cuttings of *Pogostemon cablin*, the true patchouli, have been received from the Bureau of Agriculture, Philippine Islands.

Pineapples. Stocks of both Mauritius and Kew pines are ready for planting when required.

Manila Hemp. A further 300 strong plants are being grown ready for Serdang.

Bromelia Fibre. Four plants of a *Bromelia* species are still in stock.

Bowstring Hemp. Further stocks are ready for planting out at Serdang.

Lemon Grass. Further stocks are available when required.

Tuba Root. Further stocks are being propagated.

Sugar Cane. A large collection of local canes, comprising 94 lots, obtained from the different districts throughout the Peninsula, was made in October, 1920; and the canes are now ready for harvesting. After being sorted and classified they will be sent out to Serdang and should provide planting material for about 5 acres.

Cover Plants. Stock plants of the majority of cover crops and green manures are available when required.

(3) SEEDS AT KUALA LUMPUR.

Roselle Fibre. Seed of the Roselle fibre plant has now been received from the Bureau of Agriculture, Philippine Islands, and from the Superintendent, Government Plantations, Kuala Kangsar, and will shortly be sent out for planting at Serdang, where land is now being prepared.

Caravonica Cotton. A small supply of seed has just been received from Kuala Pilah.

Pepper. About 10 lbs of seed received from Penang.

Nutmegs. 1,000 seeds received from Penang, sufficient to plant 10 acres.

Tobacco. A small quantity of tobacco seed received from Ceylon.

Miscellaneous Seeds. The following seeds have been received from the United States Department of Agriculture, Washington.

Soya Bean, Biloxi	Early Buff Cowpea
Bush Velvet Bean	Victor Cowpea
Georgia Velvet Bean	Groit Cowpea
Ootootan Soya Bean	Mammoth Blackeye Cowpea
Brabham Cowpea	
Honey Sorgo	Orange Sorgo
Sumac Sorgo	Gooseneck Sorgo
Napier Grass	Red Amber Sorgo
Carpet Grass	Merker Grass
Dallis Grass	Rhodes Grass
Sudan Grass	Bahia Grass
Beggarweed.	Alabama Grass

LABOUR

At the present time there is a plentiful supply of Chinese labour available in the Serdang district at the following rates of pay—adult males 55 cts, adult females 50 cts, and minors 25 cts per day, which is remarkably low for this class of labour. So far the work has been carried out by casual labour and it will be advisable later to have a number of permanent labourers resident on the plantation to carry out regular work.

BUILDINGS.

A temporary hostel is being erected on the plantation and will shortly be completed, when it will be possible to give more time to details in connection with the planting out of crops which are now ready to leave the nurseries.

WATER SUPPLY.

There appears to be a plentiful supply of good water available on the plantation and the Director of Public Works has been asked to draw up a suitable scheme for supplying the future needs of the plantation and submit an estimate as to its probable cost.

ROADS.

The plantation is situated about two miles from the main road from Sungei Besi to Kajang and is only approachable by a rough cart-track, parts of which are inundated with water during wet weather. The absence of a permanent access road to the plantation will very soon prove a serious drawback to its development and it is hoped that conditions will allow of the construction of such a road being commenced as early as possible and completed early next year. A number

of buildings is to be erected on the plantation during the coming year and the construction of a permanent road will greatly facilitate the transportation of building material to the sites which have been selected.

GENERAL.

There is no doubt that the present area of flat and undulating land, suitable for the cultivation of temporary crops, will prove far too small for future requirements and steps are being taken to obtain a further area of 350 acres of State Land in the Mining Reserve adjoining the plantation.

The addition of the above area will make a considerable difference to the value of the plantation from an experimental point of view and it will be possible either to increase the areas under each crop or to increase the number of crops under experiment, whichever may prove necessary. Further, it will also be possible to reserve a block of at least 100 acres for an economic garden, where every plant of economic importance can be represented by plots varying from $1/40$ to $1/2$ an acre, according to the size or nature of the plant to be included in the garden. An economic garden of this description would not only be of considerable value from a botanical standpoint in connection with plant-breeding, but would be of considerable interest to the general planting public in illustrating the different types of economic plants, together with their general habit of growth. Further information on any particular crop grown on a large scale could, in a large number of cases, be obtained in the field.

In conclusion it may be stated that excellent progress has been made so far and, with one or two exceptions, sufficient planting material has been procured to carry out the programme which was previously arranged.

PROPOSED PLANTING PROGRAMME FOR SERDANG.

Crop.	1921	1922	1923	Total.	Remarks.
FOOD CROPS.	acres.	acres.	acres.	acres.	
Tapioca	2	—	—	2	
Sugar-Cane	10	10	30	50	
Bananas	2	8	—	10	
Groundnuts	1	10	—	11	
Sago Palm	5	5	—	10	
Sugar Palm	10	—	—	10	
Coffee	10	5	—	15	
Cocoa	—	1	—	1	
Tea	—	15	—	15	
Pineapples	1	4	—	5	
Soya Bean	2	—	—	2	
OILS AND FATS.					
African Oil Palm	—	50	50	100	
Castor oil	20	—	—	20	
Candle nut	—	10	10	20	
Gingelly	10	—	—	10	
Tenkawang	5	—	—	5	
Citronella grass	10	—	—	10	
Lemon Grass	10	—	—	10	
Patchouli	1	1	5	10	
Bay Trees	—	1	—	1	<i>Avenue or hedges</i>
FIBRES.					
Sisal Hemp	25	—	—	25	
Mauritius Hemp	25	—	—	25	
Manila Hemp	$\frac{1}{2}$	2	8	$10\frac{1}{2}$	
Sunn Hemp	5	—	—	5	
Rhamie	1	—	—	1	
Bowstring Hemp	1	—	—	1	
Cotton	1	5	—	6	
Kapok	—	25	—	25	
Roselle	10	—	—	10	
SPICES.					
Nutmeg	—	10	—	10	
Cinnamon	10	—	—	10	
Cloves	—	10	—	10	
Pepper	—	—	10	10	
Vanilla	$—\frac{1}{2}$	—	1	$1\frac{1}{2}$	
Carried Forward.	178	175	114	167	

PROPOSED PLANTING PROGRAMME FOR SERDANG (CONT.)

Crop.	1921	1922	1923	Total.	Remarks.
	acres.	acres.	acres.	acres.	
Brought Forward	178	175	114	467	
DRUGS.					
Ipecacuanha	2	—	2	4	Planted in Jungle strips.
Coca	1	—	4	5	
Croton oil	—	5	—	5	To be consider- ed later.
Camphor	—	—	—	—	
Kola nut	5	—	5	—	
DYESTUFFS.					
Indigo	10	—	—	10	
Annatto	5	—	—	5	
Gambier	1	—	50	51	
MISCELLANEOUS PRODUCTS.					
Tobacco	1	—	—	1	
Tuba Root	—	5	5	10	
Brazil Nut	—	10	—	10	
Limes	20	20	10	50	
FODDER PLANTS.					
Guinea Grass	2	—	—	2	
Total.	225	215	185	625	

NOTES: This programme is a provisional one and therefore subject to alteration from time to time in order to meet any requirements which may arise later.

CENTROSEMA PLUMIERI.

NOTE ON THE OIL CONTENT OF THE SEEDS.

BY C. D. V. GEORGI.

ENQUIRIES have been received regarding the possibility of utilising for oil extraction the surplus amounts of this seed, which is being planted to such a large extent on estates as a cover crop. Although this plant is a legume and its seed is therefore unlikely to have a high oil content, the complete analysis was undertaken in order to obtain exact data.

The results were as follows:—

Number of seeds per oz.	153
equivalent to per lb.	2448
Proportion of kernel	74.7 per cent.
„ of husks	25.3 „
	100.00

			Whole Seed.		Husk.		Kernel.
			per cent.		per cent.		per cent.
Moisture	...	...	14.77	...	13.47	...	15.67
Ash	...	...	2.24	...	2.18	...	2.35
Organic and Volatile matter							
(by difference)			82.99	...	84.35	...	81.98
			100.00		100.00		100.00

Containing

Nitrogen	...	...	2.84	...	0.74	...	3.54
Oil	...	...	1.25	...	—	...	1.67

From these results it will be seen that, as expected, the oil content is very low and that its extraction as a commercial proposition is not to be considered.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bharu	...	146.76	79.5	87.70	72.24	14.96	75.5	.804	72.7	79	...	5.80	1.32
Pahang, Kuala Lipis ...	...	...	79.52	86.67	73.35	13.35	75.19	...	—	...	...	8.52	2.27
Johore, Johore Bharu	...	...	...	87.24	73.22	...	...	...	—	...	...	4.77	1.20
Singapore, Kangar Kerbau	1015.0	103.5	81.33	84.7	66.8	...	78.1	...	—	...	Caln.	6.03	1.61
Malacca, Durian Daun	1017.7	133.00	81.00	88.00	73.00	15.00	77.00	.890	—	81.00	N.	2.95	.92
Negri Sembilan, Seremban	...	141.9	79.9	89.6	72.9	16.7	75.6	.800	72.7	78.8	N. W.	8.59	1.25
" Kuala Pilah ...	...	155.1	80.00	87.2	71.1	16.1	76.5	.844	75.4	82.8	...	10.16	3.60
" Port Dickson	...	152.6	82.6	87.6	73.6	13.7	77.2	.845	74.4	78.6	...	4.64	1.10
Selangor, Kuala Lumpur	...	...	82.3	90.6	70.4	20.2	76.8	.816	73.2	74.	S. E.	8.61	2.36
" Klang	...	...	80.1	84.3	74.5	9.8	76.3	...	...	...	—	8.16	1.47
" Kuala Selangor	...	...	...	90.	69.9	20.1	...	...	...	...	—	5.58	2.78
" Rawang	...	...	...	89.6	72.6	17.0	...	...	...	...	—	7.70	1.48
Perak, Telok Anson	...	...	80.93	92.	70.	22.	76.62	.860	...	82.	—	5.62	1.65
" Ipoh	...	...	80.83	93.	70.	23.	75.14	.829	73.54	80.	—	11.41	1.61
" Taiping	...	...	82.05	92.	70.	22.	78.65	.924	...	87.	—	23.89	2.48
" The Cottage	...	...	...	...	...	...	...	—	...	...	—	27.57	5.98
" Parit Buntar	...	...	82.22	92.	71.	21.	77.47	.878	70.6	83.	—	4.56	.90
Penang, George Town...	1008.5	160.	80.2	94.	70.	24.	77.8	.913	...	88.9	N. W.	5.47	1.69
Kedah, Alor Star	...	...	...	...	...	...	...	—	...	...	—	3.49	1.16
Perlis, Kangar	...	...	...	88.90	71.74	17.16	...	...	...	...	—	3.14	1.30

